A SAMPLING OF APPROACHES FOR EVALUATING RECONTAMINATION

T4 Recontamination Evaluation
BBL, April 2005

Objective: Propose a methodology for assessing the potential for sediment recontamination in the Removal Action Area.

Methodology: Estimate post-Removal Action mass flux of COPCs to surface sediment, contaminant fate and transport within the surface sediment, and long-term COPC concentration for each subarea. The spatial scale and variations of COPC loading rates will also be considered. The spatial scale for sources and processes may vary , e.g., fine-grained sediment from upstream sources has an area-wide effect while the depositional delta from a stormwater outfall may be local.

Assumptions:

- Contaminant loading from potentials sources is typically dominated by the transport and deposition of contaminants associated with fine particulate matter. As a result, the evaluation will focus on particle transport (i.e., sediment transport) to surface sediment.
- For purposes of the recontamination assessment, future trends related to the estimated annual loading rates for stormwater outfalls will be evaluated based on info regarding future land uses. In general, it is anticipated that mass loading rates will gradually decline based upon source control activities and improvement in the use of BMPs.
- Direct runoff and soil erosion not expected to represent significant sources.

Stormwater Loading Calculation:

a. Sample outfalls within and upstream of the Removal Action Area that are characteristic of the basin (total of 7 outfalls selected)
b. Estimate annual runoff volume using SWMM
c. Estimate mass loading for a range of total suspended solids and contaminants concentrations based on sampling data and land use data for outfalls that are not directly sampled
d. For outfalls selected for sampling:
    i. Install in-line sediment traps
    ii. Collect one round of SW samples and analyze for TSS and TDS
    iii. Use data, in conjunction with estimates of annual SW runoff volume, to calculate mass loading of particle-bound COPCs for each outfall
    iv. Sediment traps won't provide an estimate of potential dissolved phase loading, but dissolved phase loading not expected to be significant compared to particle-bound constituents
e. Install additional sediment traps immediately upstream of RAA to assess overall influences from upstream sources. If data indicates a potential recontamination source (e.g., upstream outfall), additional outfall sampling would likely occur.

Thea Foss Recontamination Evaluation
Todd Thornburg, Anchor Environmental, May 2003

Contaminants of Concern: Several PAHs and one phthalate (BEP)

Objective: Provide a management tool to help prevent recontamination. Three specific objectives:

- Improved management of contaminant sources by increasing the understanding of the cumulative effects of the various sources.
- Early warning of recontamination by being able to compare post-remediation sediment quality data to the pollutant specific sediment recovery curves generated by the model
- Evaluation of source control efforts by being able to compare local sediment data to the recovery curve to determine where expectations are being met and where they aren't.

Methodology: Sediment recovery targets are based on Commencement Bay SQOs. Use the WASP model to establish sediment recovery curves to help interpret post-remediation sediment quality monitoring data and to provide an early warning of recontamination if it occurs. Input data reflects numerous significant improvements that are expected to reduce loading and result in improved sediment quality in the future (reduction in MS4 contaminant loads, remediation efforts, recently implemented BMPs, etc.). To test these assumptions, the modeling effort includes a monte carlo uncertainty analysis.

Stormwater Loading Calculation:
Annual solid load = total annual flow (vol/yr) X avg TSS conc. (mass/vol)
Annual flow can be measured (e.g., flow meters) or estimated using runoff coefficients (SWMM). The analysis estimates that stormwater contributes 13-22 percent of total PAH load and 54% of total BEP load.

Calleguas Creek OC and PCB TMDL (June 2005)

Objective: Determine the loading capacity for each pollutant and allocate load allocations for each type of source. Fish tissue/human health is the focus of the TMDL; no toxicity problems were identified in water or sediment.

Assumptions:

- The OCs of concern in this TMDL all sorb strongly to particles. Thus, the gross movement of OCs through the watershed can be modeled as transport on the particulate phase. Although this simplifying assumption helps model watershed loads, site-specific factors that can enhance solubility (especially in pore waters) do need to be considered with regards to effects on beneficial uses.
- DDE was chosen as a representative constituent for analyses because DDE was the only constituent to consistently exceed applicable targets in water, sediment, and tissue samples, and also because OC Pesticides and PCBs possess similar physical and chemical properties that influence their fate and transport in the environment.
- The representative relationship is probably least appropriate for dacthal and for PCBs. However, there is little need for concern in the case of dacthal, since it is a category-2 constituent. In the case of PCBs, which have more widely ranging chemical properties and a significantly different use history, the compliance monitoring and adaptive management components outlined in the Implementation Plan will adequately address any issues that become apparent over time.
- One additional benefit of using DDE as a representative constituent is that it is one of the most persistent OCs, which means that implementation measures and timescales set for achieving DDE targets will facilitate achievement of targets for the other OCs.

Stormwater Loading Calculation:
Loads were calculated by multiplying DDE concentration estimates for each land use (derived from local runoff and point source data) times daily mean flow values (using a site specific model). To test these calculations, they compared the results to actual DDE loads in water from representative reaches. In 5 out of 6 subbasins, the calculated load runoff exceed the loads in receiving water (but generally same order of magnitude). One potential explanation for the discrepancy is the fact that runoff samples were collected disproportionately more frequently during storm events.

San Diego Creek PCB and OCs TMDL (part of Newport Bay TMDL, June 2002)
http://www.epa.gov/region9/water/tmdl/nbay/summary0602.pdf

Objective: Determine the loading capacity for each pollutant and allocate load allocations for each type of source. Long term loadings at or below the loading capacities should eventually result in reduction in concentrations to levels protective of the standards.

Methodology:
Numeric sediment targets for PCBs were selected from NOAA Sediment Screening Quick Reference Tables (21.5 - 34.1 ppm). Loading capacities were determined by "back calculating" the allowable load from the selected sediment target and the associated estimates of sediment loads.

Stormwater Loading Calculation:

1) Particulate pollutant concentrations were calculated using information on the suspended sediment concentrations in the creek under three flow tiers.
2) The suspended sediment concentration corresponding to each of the flow tiers was calculated based on the observation data and regression results from the Feasibility Report for Upper Newport Bay (RMA 1997). The values are 97, 1,730, and 5,011 mg/L for the base and small, medium, and high flow tiers, respectively. The following is the regression equation used in the analysis:

$$\log(y) = -\ 0.09(\log(x)^2 + 2.24(\log(x)) -1.96$$

where: x = flow (cfs) and y = sediment (tons/day)

3) Because the organochlorine compounds have a strong affinity for sediment, partition coefficients, which describe the ratio of a compound adsorbed to solids and in solution, were identified and used with the particulate concentrations to estimate the dissolved concentration. The sum of the particulate and dissolved concentrations represented the total concentration of the pollutant in the water column.
4) The calculation of existing loads was accomplished using the same general procedure outlined above for the loading capacity. The primary differences include:
    a. Recent fish tissue data were used with BCFs to back calculate the dissolved pollutant concentrations.
    b. Partition coefficients were used with the dissolved concentrations to estimate the particulate fraction.
    c. The total concentration and flow were used to calculate existing loads—no comparison to water quality criterion was conducted.

Figure F-1. Approach to Developing Loading Capacities and Existing Loads in San Diego Creek